Amendment to the Claims:

This listing of claims replaces all prior versions, and listings, of claims in the application:

1. Canceled.

2. **(Currently Amended)** ~~The filter of claim 1, further comprising~~:

An optical carrier notch filter, comprising:

an optical coupler including at least a first, a second and a third port, the first port being configured to receive an output that includes an optical carrier and interleaved optical single sideband signals;

an optical bandpass filter coupled to a port of the optical coupler, the optical bandpass filter separating the output into a transmitted signal that contains the optical carrier and a reflected signal that includes the interleaved optical single sideband signals that are reflected from the optical bandpass filter to the third port of the optical coupler; and

an external modulator coupled to the optical bandpass filter and the coupler ~~setup in claim 1~~ to receive the optical carrier, the external modulator modulating the optical carrier to create a modulated optical carrier.

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3. (Original) The filter of claim 2, wherein a baseband signal is applied to the external modulator to modulate the optical carrier and create the modulated optical carrier.

4. (**Currently Amended**) The filter of claim 2 [[1]], wherein the optical single sideband signals have unequal channel spacings.

5. (**Currently Amended**) filter of claim 2 [[1]], further comprising:

a coupler used to combine the modulated optical carrier with the interleaved optical single sideband signals.

6. (**Currently Amended**) The filter of claim 2 [[1]], wherein the optical bandpass filter is centered at the same wavelength as the optical carrier.

7. (**Currently Amended**) The filter of claim 2 [[1]], wherein the optical coupler is a circulator.

8. Canceled.

9. Canceled.

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10. **(Currently Amended)** ~~The filter of claim 9, further comprising:~~

An optical carrier notch filter, comprising:

a multiple port circulator including at least a first, a second and a third port;

an optical bandpass filter coupled to the second port of the multiple port circulator, the optical bandpass filter separating an output received from the circulator into a transmitted signal that contains an optical carrier and a reflected signal that includes interleaved optical single sideband signals and is reflected from the optical bandpass filter to the third port of the circulator; and

a modulator coupled to the optical bandpass filter to receive the optical carrier, a modulating signal is applied to the electrodes of the modulator modulating the carrier to form a modulated optical carrier.

11. **(Currently Amended)** The filter of claim **10** [[9]], further comprising:

a coupler coupled used to combine the modulated optical carrier with the interleaved sideband signals.

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12. (**Currently Amended**) The filter of claim 10 [[9]], wherein the ~~interleaved single sideband~~ modulator includes a source that produces first and second sidebands with frequencies that are offset from their harmonics and/or the other sideband's residual image.

13. (Original) The filter of claim 12, wherein the offset frequencies are different for the first and second sidebands.

14. Canceled.

15. (Previously presented) An interleaved optical single sideband communications system comprising:

an optical modulator, constructed and arranged to accept an incoming optical carrier and including:

a splitter which splits the incoming optical signal into a first optical carrier and a second optical carrier;

a first AC phase modulator to apply a first electrical signal carrying a plurality of first channels to modulate the first optical signal;

a second AC phase modulator to apply a second electrical signal carrying a plurality of second channels to modulate the second optical signal, each first channel corresponding to one

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of the second channels, and each first channel being phase shifted 90° relative to each corresponding second channel;

a first DC phase modulator to modulate the first optical signal;

a second DC phase modulator to modulate the second optical signal, the first and second DC phase modulators constructed and arranged to modulate an optical carrier component of the first optical signal to be phase shifted 90° relative to an optical carrier component of the second optical signal, the optical carrier component of the second optical signal having a frequency substantially equal to the optical carrier component of the first optical signal;

a directional coupler that coupled to the optical modulator and combines the modulated first and second optical signals to form a combined optical signal having an optical carrier component, such that alternate channels of the combined optical signal are substantially cancelled; and

wherein the optical modulator creating a plurality of first single side bands on a side of the optical carrier frequency, a plurality of first residual images on the opposite side of the optical carrier frequency, a second side bands on a side of the optical carrier frequency, and a plurality of second residual images on the opposite side of the optical carrier frequency.

16. (Previously presented) The system of claim 15, wherein frequencies of the plurality of first side bands is offset from the plurality of second residual images, and frequencies of the plurality of second side bands is offset from the first residual images.

17. (Previously presented) The system of claim 15, further comprising:

an optical carrier notch filter coupled to the optical modulator.

18. (Original) The system of claim 17, wherein the optical carrier notch filter comprises:

an optical coupler including at least a first, a second and a third port, the first port being configured to receive an output that includes an optical carrier and interleaved optical single sideband signals;

an optical bandpass filter coupled to a second port of the optical coupler, the optical bandpass filter separating the output into a transmitted signal that contains the optical carrier and a reflected signal that includes the interleaved optical single sideband signals that are reflected from the

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optical bandpass filter to the third port of the optical coupler.

19. (Original) The system of claim 17, wherein the optical carrier notch filter comprises:

an optical coupler including at least a first, a second and a third port, the first port being configured to receive an output that includes an optical carrier and interleaved optical single sideband signals;

an optical narrowband reject filter coupled to a second port of the optical coupler, the optical narrowband reject filter separating the output into a reflected signal that contains the optical carrier and a transmitted signal that includes the interleaved optical single sideband signals that are transmitted through the optical narrowband reject filter.

20. (Original) The system of claim 18, further comprising:

an external modulator coupled to the optical bandpass filter, the external modulator modulating the optical carrier to create a modulated optical carrier.

21. (Previously presented) An interleaved optical single sideband communications system comprising:

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an optical modulator, constructed and arranged to accept an incoming optical carrier, the optical modulator comprising:

a splitter which splits the incoming optical signal into a first optical carrier and a second optical carrier;

a first AC phase modulator to apply a first electrical signal carrying a plurality of first channels to modulate the first optical signal;

a second AC phase modulator to apply a second electrical signal carrying a plurality of second channels to modulate the second optical signal, each first channel corresponding to one of the second channels, and each first channel being phase shifted 90° relative to each corresponding second channel;

a first DC phase modulator to modulate the first optical signal;

a second DC phase modulator to modulate the second optical signal, the first and second DC phase modulators constructed and arranged to modulate an optical carrier component of the first optical signal to be phase shifted 90° relative to an optical carrier component of the second optical signal, the optical carrier component of the second optical signal having a frequency substantially equal to the optical carrier component of the first optical signal;

a combiner which combines the modulated first and second

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optical signals to form a combined optical signal having an optical carrier component, such that alternate channels of the combined optical signal are substantially cancelled; and

a notch filter coupled to the optical modulator, the notch filter including, an optical coupler including at least a first, a second and a third port, the first port being configured to receive an output that includes an optical carrier and interleaved optical single sideband signals, and an optical bandpass filter coupled to a second port cf the optical coupler, the optical bandpass filter separating the output into a transmitted signal that contains the optical carrier and a reflected signal that includes the interleaved optical single sideband signals that are reflected from the optical bandpass filter to the third port of the optical coupler.

22. (Previously presented) The system of claim 21, wherein the optical modulator creates a first single side band on a side of the optical carrier frequency with a first residual image on the opposite side of the optical carrier frequency, a second side band on a side of the optical carrier frequency with a second residual image on the opposite side of the optical carrier frequency; and a frequency of the first side band is offset from the residual image and harmonics of the second

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sideband, and a frequency of the second side band is offset from the residual image and harmonics of the first sideband.

23. (Previously presented) An interleaved optical single sideband communications system comprising:

an optical modulator, constructed and arranged to accept an incoming optical carrier, the optical modulator comprising:

a splitter which splits the incoming optical signal into a first optical carrier and a second optical carrier;

a first AC phase modulator to apply a first electrical signal carrying a plurality of first channels to modulate the first optical signal;

a second AC phase modulator to apply a second electrical signal carrying a plurality of second channels to modulate the second optical signal, each first channel corresponding to one of the second channels, and each first channel being phase shifted 90° relative to each corresponding second channel;

a first DC phase modulator to modulate the first optical signal;

a second DC phase modulator to modulate the second optical signal, the first and second DC phase modulators constructed and arranged to modulate an optical carrier component of the first optical signal to be phase shifted 90° relative to an optical

carrier component of the second optical signal, the optical carrier component of the second optical signal having a frequency substantially equal to the optical carrier component of the first optical signal;

a combiner which combines the modulated first and second optical signals to form a combined optical signal having an optical carrier component, such that alternate channels of the combined optical signal are substantially cancelled; and

a notch filter coupled to the optical modulator, the notch filter including, an optical coupler including at least a first, a second and a third port, the first port being configured to receive an output that includes an optical carrier and interleaved optical single sideband signals, and an optical bandpass filter coupled to a second port of the optical coupler, the optical bandpass filter separating the output into a reflected signal that contains the optical carrier and a transmitted signal that includes the interleaved optical single sideband signals that are transmitted through the optical bandpass filter.

24. (Previously presented) An interleaved optical single sideband communications system comprising:

an optical modulator, constructed and arranged to accept an

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incoming optical carrier, the optical modulator comprising:

a splitter which splits the incoming optical signal into a first optical carrier and a second optical carrier;

a first AC phase modulator to apply a first electrical signal carrying a plurality of first channels to modulate the first optical signal;

a second AC phase modulator to apply a second electrical signal carrying a plurality of second channels to modulate the second optical signal, each first channel corresponding to one of the second channels, and each first channel being phase shifted 90° relative to each corresponding second channel;

a first DC phase modulator to modulate the first optical signal;

a second DC phase modulator to modulate the second optical signal, the first and second DC phase modulators constructed and arranged to modulate an optical carrier component of the first optical signal to be phase shifted 90° relative to an optical carrier component of the second optical signal, the optical carrier component of the second optical signal having a frequency substantially equal to the optical carrier component of the first optical signal;

a combiner which combines the modulated first and second optical signals to form a combined optical signal having an

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optical carrier component, such that alternate channels of the combined optical signal are substantially cancelled; and

wherein the optical modulator creates a first single side band on a side of the optical carrier frequency with a first residual image on a side of the optical carrier frequency, a second side band on a side of the optical carrier frequency with a second residual image on a side of the optical carrier frequency; and a frequency of the first side band is offset from the second residual image, and a frequency of the second side band is offset from the first residual image.

25. (Previously presented) The interleaved optical single sideband communications system according to claim 24, further comprising:

an input polarization controller, constructed and arranged to control a polarization of the incoming optical signal;

a polarization maintaining input optical fiber, constructed and arranged to accept the incoming optical signal from the input polarization controller and to provide the incoming optical signal to the modulator.

26. (Previously presented) The interleaved optical single sideband communications system according to claim 24, further

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comprising:

a light emitting device, constructed and arranged to produce the incoming optical carrier and inject the incoming optical carrier into the modulator;

a notch filter, disposed after the modulator, the notch filter filtering a range of wavelengths including a wavelength of the optical carrier component of the combined optical signal;

a dispersion compensation device, disposed after the notch filter.

27. (Previously presented) The interleaved optical single sideband communications system according to claim 26, wherein an amplifier is disposed after the fiber dispersion compensation device.

28. (Original) An interleaved optical single sideband communications system according to claim 27, wherein the amplifier is a erbium doped fiber amplifier.

29. (Previously presented) The interleaved optical single sideband communications system according to claim 26, wherein the dispersion compensation device is a device selected from the group consisting of: a length of dispersion compensating fiber

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and a chirped fiber Bragg grating.

30. (Previously presented) The interleaved optical single sideband communications system according to claim 24, further comprising an optical receiver receiving the combined optical signal, the optical receiver comprising:

an optical filter, constructed and arranged to pass a range of frequencies corresponding to a selected channel of the combined optical signal; and

an optical receiver, receiving the selected channel.

31. (Previously presented) The interleaved optical single sideband communications system according to claim 30, wherein the optical filter further comprises a tunable narrowband optical filter, tunable among a plurality of ranges of frequencies corresponding to channels carried in the combined optical signal.

32. (Previously presented) The interleaved optical single sideband communications system according to claim 31, wherein the tunable narrowband optical filter further comprises a feedback circuit such that the filter passband can be locked on to a center (or off-center) of a channel to be passed through

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the filter.

33. (Previously presented) The interleaved optical single sideband communications system according to claim 30, wherein the optical filter further comprises a plurality of fixed narrowband optical filters, each corresponding to a range of frequencies corresponding to a single channel carried in the combined optical signal,

and the optical receiver further comprises a plurality of optical receivers each of which is disposed after a corresponding one of the fixed narrowband optical filters to receive a single channel therefrom.

34. (Previously presented) The interleaved optical single sideband communications system according to claim 24, further comprising:

a wideband optical receiver; and

a plurality of demodulators, each demodulator constructed and arranged to extract a range of frequencies from the combined optical signal corresponding to a single channel.

35. (Previously presented) The interleaved optical single sideband communications system according to claim 24, further

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comprising:

a plurality of directional couplers disposed in series before the modulator, the directional couplers combining a plurality of channels to produce a combined electrical signal from which the first and second plurality of electrical signals are derived.

36. Canceled.

37. **(Currently Amended)** ~~The method of claim 36, further comprising:~~

A method of modulating an optical carrier, comprising:

receiving an output that includes an optical carrier and interleaved sideband signals;

separating the interleaved sideband signals from the optical carrier;

modulating the optical carrier to create a modulated optical carrier; and

combining the interleaved sideband signals with the modulated optical carrier.

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38. (**Currently Amended**) The method of claim 37 ~~[[36]]~~, wherein the interleaved sideband signals have frequencies that are offset from the ITU Grid.

39. Canceled.

40. Canceled.

41. (Previously presented) A method of modulating an optical carrier frequency in an optical modulator that includes a first phase modulator and a second phase modulator, comprising:

splitting a power of the optical carrier frequency into a first portion and a second portion;

introducing the first portion of the carrier signal frequency to the first phase modulator and the second portion of the carrier signal frequency to the second phase modulator;

applying a first signal to the first phase modulator at a first phase and to the second phase modulator at a second phase;

creating a first single side band on a side of the optical carrier frequency, and a first residual image on a side of the optical carrier frequency;

applying a second signal to the first phase modulator at a

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first phase and to the second phase modulator at a second phase

creating a second side band on a side of the optical carrier frequency, and a second residual image on a side of the optical carrier frequency; and

wherein a frequency of the first side band is offset from the second residual image, and a frequency of the second side band is offset from the first residual image.

42. (Original) The method of claim 41, wherein a frequency of the first sideband is higher than the optical carrier frequency and a frequency of the second sideband is lower than the optical carrier frequency.

43. (Original) The method of claim 41, wherein a frequency of the first sideband is higher than the optical carrier frequency and a frequency of the second sideband is higher than the optical carrier frequency.

44. (Original) The method of claim 41, wherein a frequency of the first sideband is lower than the optical carrier frequency and a frequency of the second sideband is lower than the optical carrier frequency.

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45. (Original) The method of claim 41, further comprising:

creating multiple single side bands on the first side of the optical carrier frequency with multiple first residual images on the other side of the optical carrier frequency; and

creating multiple single side bands on the second side of the optical carrier frequency with multiple second residual images on the other side of the optical carrier frequency; and

wherein frequencies of the multiple first side bands are offset from the second residual images, and frequency of the multiple second side bands are offset from the first residual images.

46. (Original) The method of claim 45, wherein higher frequency sideband signals are offset from harmonics of lower frequency sideband signals.

47. (Original) The method of claim 41, wherein the first and second sidebands are offset from spurious signals.

48. (Original) The method of claim 42, wherein the spurious signals are selected from harmonics and intermodulations.

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49. (Original) The method of claim 41, wherein the first side band and the first residual image are on opposite sides of the carrier signal frequency.

50. (Previously presented) The method of claim 41, wherein the second side band and the second residual image are on opposite sides of the carrier signal frequency.

51. (Original) The method of claim 50, wherein the first and second side bands are on opposite sides of the carrier signal frequency.

52. (Previously presented) The method of claim 41, wherein the optical modulator is a single Mach Zehnder interferometer.

53. (Previously presented) A method of transmitting a plurality of channels, comprising:

providing a plurality of electrical signals with adjustable powers and frequencies, each electrical signal corresponding to a channel;

producing a first and a second split signal corresponding to each of the plurality of signals, each first split signal being substantially at quadrature with a corresponding second

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split signal;

providing an optical carrier signal;

multiplexing the optical carrier signal with the split signals to produce a multiplexed optical signal such that alternate channels are substantially cancelled and residual images of upper side band channels do not substantially overlap channels carried on a lower side band;

interleaving the at least one multiplexed optical signal to reverse positive and negative frequencies of adjacent wavelengths are reversed.

54. (Original) A method according to claim 53, further comprising filtering the multiplexed optical signal to remove the optical carrier signal.

55. (Previously presented) A method according to claim 53, wherein the at least one multiplexed optical signal is further combined with at least one additional multiplexed optical signal by dense wavelength division multiplexing.

56. (Previously presented) The method according to claim 55, wherein the multiplexed wavelengths are interleaved in such

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a way that the positive and negative frequencies in the neighboring wavelengths are reversed.

57. (Previously presented) The system of claim 15, wherein the optical modulator is a single Mach-Zehnder modulator.

58. (Previously presented) The system of claim 21, wherein the optical modulator is a single Mach-Zehnder modulator.

59. (Previously presented) The system of claim 23, wherein the optical modulator is a single Mach-Zehnder modulator.

60. (Previously presented) The system of claim 24, wherein the optical modulator is a single Mach-Zehnder modulator.

61. (Previously presented) The method of claim 41, wherein the optical modulator is a single Mach-Zehnder modulator.

62. (**Currently Amended**) The filter of claim **10** [[9]], wherein frequencies and power of the sidebands are adjustable.

63. (Previously presented) The filter of claim 15, wherein frequencies and power of the sidebands are adjustable.

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64. (**New**) An optical communication system, comprising at least one optical transmitter which comprises:

an electrical modulation control unit to produce a first modulation control signal comprising a plurality of first channel signals at different and equally spaced channel frequencies and a second modulation control signal comprising a plurality of second channel signals that are respectively at the different channel frequencies of the first channel signals and respectively carry the same channel information as the first channel signals, wherein two adjacent channel signals in each of the first and the second modulation control signals have a relative phase shift of 90 degrees, and wherein each channel signal in the first modulation control signal has a relative phase shift of 90 degrees with respect to a corresponding channel signal at the same channel frequency in the second modulation control signal; and

a Mach-Zehnder optical modulator comprising an input port to receive an optical carrier at an optical carrier frequency, a first optical path and a second optical path which receive a first portion of the optical carrier as a first optical carrier and a second portion of the optical carrier as a second optical carrier, respectively, and an output port to combine light from the first and second optical paths to produce an optical output signal which carries output channel signals having the same channel information of the first and second channel signals and a frequency spacing between two adjacent output channel signals being twice a frequency spacing between two adjacent channel signals in the first and second modulation control signals,

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wherein the first optical path receives and responds to the first modulation control signal to modulate the first optical carrier to carry the first channel signals on both sides of the optical carrier frequency, and the second optical path receives and responds to the second modulation control signal to modulate the second optical carrier to carry the second channel signals on both sides of the optical carrier frequency and to produce a phase shift of 90 degrees in light in the second optical path relative to light in the first optical path.

65. (**New**) The system as in claim 64, wherein the Mach-Zehnder optical modulator in the optical transmitter comprises a first electrode along the first optical path to receive the first modulation control signal and a second electrode along the second optical path to receive the second modulation control signal.

66. (**New**) The system as in claim 65, wherein the Mach-Zehnder optical modulator in the optical transmitter comprises a first DC electrode along the first optical path to bias the first optical path and a second DC electrode along the second optical path to bias the first optical path to produce the phase shift of 90 degrees in light in the second optical path relative to light in the first optical path.

67. (**New**) The system as in claim 64, wherein the electrical modulation control unit in the optical transmitter comprises:

a plurality of electrical signal paths respectively corresponding to a number of channel signals in each of the first and second channel signals to produce a plurality of signal channels at the different channel frequencies,

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respectively, wherein each electrical signal path comprises a signal mixer to mix a data channel with a local oscillator signal at one of the different channel frequencies to produce a channel signal, and means for splitting the channel signal into a first channel signal and a second channel signal that is phase shifted by 90 degrees relative to the first channel signal;

first summing means for combining first channel signals from the plurality of electrical signal paths to produce the first modulation control signal; and

second summing means for combining second channel signals from the plurality of electrical signal paths to produce the second modulation control signal.

68. **(New)** The system as in claim 67, wherein each electrical signal path comprises a low pass signal filter to filter the data channel prior to entry to the signal mixer and a bandpass filter coupled between the mixer and the splitting means to filter the channel signal.

69. **(New)** The system as in claim 64, further comprising:

a second optical transmitter similarly constructed as the optical transmitter and configured to produce a second optical output signal which carries a plurality of channel signals on a second optical carrier at a second optical carrier frequency different from the optical carrier frequency; and

an optical device to receive and combine the optical output signal from the optical transmitter and the second optical output signal from the second optical transmitter into an optical wavelength-multiplexed signal.

70. **(New)** The system as in claim 69, further comprising:

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a first dispersion compensating device coupled between the optical transmitter and the optical device; and

a second dispersion compensating device coupled between the second optical transmitter and the optical device.

71. (**New**) The system as in claim 64, wherein the optical transmitter further comprises a laser to produce the optical carrier at the optical carrier frequency received by the input port of the Mach-Zehnder optical modulator.

72. (**New**) A method for modulating a plurality of channels at different channel frequencies onto an optical carrier at an optical carrier frequency, comprising:

electronically producing a first modulation control signal which comprises a plurality of first channel signals at different and equally spaced channel frequencies and a second modulation control signal which comprises a plurality of second channel signals that are respectively at the different channel frequencies of the first channel signals and respectively carry the same channel information as the first channel signals, wherein two adjacent channel signals in each of the first and the second modulation control signals have a relative phase shift of 90 degrees, and wherein each channel signal in the first modulation control signal has a relative phase shift of 90 degrees with respect to a corresponding channel signal at the same channel frequency in the second modulation control signal;

applying the first modulation control signal to a first optical path of a Mach-Zehnder optical modulator to module a first portion of the optical carrier in the first optical path to carry the first channel signals on both sides of the optical carrier frequency;

applying the second modulation control signal to a second optical path of the Mach-Zehnder optical modulator to module a second portion of the optical carrier in the second optical path to carry the second channel signals on both sides of the optical carrier frequency;

biasing a relative phase between the first and the second optical path to produce a phase shift of 90 degrees in light in the second optical path relative to light in the first optical path; and

combining light from the first and second optical paths to produce an optical output signal which carries the first channel signals.

73. **(New)** The method as in claim 72, wherein electronically producing comprises:

mixing a data channel with a local oscillator signal to produce a channel signal for each channel,

splitting the channel signal into a first channel signal and a second channel signal that is phase shifted by 90 degrees relative to the first channel signal;

combining first channel signals to produce the first modulation control signal; and

combining second channel signals to produce the second modulation control signal.

74. **(New)** The method as in claims 73, further comprising:

using a first set of cascaded directional couplers to respectively receive first channel signals to achieve the combining of the first channel signals; and

using a second set of cascaded directional couplers to respectively receive second channel signals to achieve the combining of the second channel signals.

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